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ABSTRACT

Three papers on attracting reentry women to engineering and technology are presented. The first paper, "Encouraging Older Women as Engineering Students," discusses the opportunities, the problems, and suggested actions for women pursuing engineering careers. The second paper, "Industrial Programs for Reentry Opportunities for Women as Engineers," discusses an employer program to encourage suitable women employees to study engineering and a company program with local colleges of engineering and engineering technology for both employees and older women throughout the local area. The third paper, "Encouraging Reentry Women as Engineering Technology Students," discusses the opportunities for women in engineering technology careers, problems encountered by students, and suggested actions for deans of engineering technology programs. (JH)

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"ATTRACTING REENTRY WOMEN TO ENGINEERING AND TECHNOLOGY"

Committee on Women in Engineering
American Society for Engineering Education
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Publication Date: 1978

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ENCOURAGING OLDER WOMEN AS ENGINEERING STUDENTS

Problems and Opportunities for Action

Committee on Women in Engineering
American Society for Engineering Education

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ENCOURAGING OLDER WOMEN AS

ENGINEERING STUDENTS

THE OPPORTUNITY

Nowadays women do have excellent opportunities in engineering careers. Many more women high school graduates are enrolling in engineering colleges than formerly. Most of the counseling efforts have been directed towards these students.

Meanwhile another recent phenomena on college campuses has been the large increase in older women college students. Current estimates are "one and a half million women college students between twenty-five and thirty-four years old" and "almost 500,000 women over thirty enrolled in college". These college-bound women, roughly age 25 to 40, represent a relatively untapped source of women engineers.

Older students, men and women, have traditionally been welcomed by their professors since they generally are serious students who do their homework well and add maturity to class discussion. A woman achieving a bachelors degree as late as age 40 has a working career of 25 years ahead of her.

PROBLEMS

The problems which arise for the older woman engineering student are generally administrative in nature and can be solved by appropriate and concerned procedures.

1. Part-time enrollment in daytime courses may be desired. Some engineering colleges have rather arbitrary rules about not allowing such registration.

2. Special counseling may be required especially for students with some prior college credits or perhaps even a degree in some other field. This should enable the student to gain maximum use of prior work.

3. Some colleges will automatically reject an application from someone with no academic studies in the last five or ten years because they fear the student has forgotten how to study.

4. If the only engineering college within feasible commuting distance turns down a woman, she cannot become an engineer unless she moves. Older women are often less mobile than men of the same age.

5. While college costs are high for all, they may be far more so per credit hour should part-time study be elected. This is often justified on the basis that part-time students usually have employment income. While many of these older women students are employed, others do not work outside the home.

6. Scholarships and loans are often more difficult for older students to obtain. Older students are less apt to participate in campus activities and this often is a factor in gaining financial assistance, along with need and high grades.

7. Scholarships and loans often cannot be awarded to part-time students.

8. Convenient, inexpensive day care for children is often needed while women students attend class.

SUGGESTED ACTIONS

1. Study present admissions procedures from the viewpoint of older women engineering students and change those that impede their enrollment. There have been studies which show that returning adults perform far better than the average "straight from high school" student.

2. Should the college retain a policy of rejection if there is no recent academic work, this should be explained in the letter of rejection with the suggestion that the applicant obtain some college credits elsewhere and reapply to the engineering college, if this is the only problem.

3. If engineering is offered as an evening program, where many students are older, be sure your catalogs and brochures mention that engineering is an increasingly popular field for women.

4. Designate a person to specialize in individual counselling of older women students in engineering and have him/her devise some sample curricula for hypothetical students, such as:

    a. A student with a BS in chemistry who wants a BSCE emphasizing sewerage treatment by attending half-time in the daytime.

    b. A student with 2 years of liberal arts including 1 year of physics but no calculus who wants to work full-time toward a BSME.

    c. A student with no college who wishes to attend daytime, working toward a BSChE at 2/3 load.

    d. A student with a BS in math with chemistry minor who wants a BSEE at about 3/4 full load.

5. Designate a person to counsel prospective older women engineering students. This counsellor should be knowledgeable about:

    a. General opportunities in engineering.

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b. Anti-discrimination laws, current salary offers for men and women engineering graduates, and actual experiences of women engineers.

c. Fields of engineering which are most sought by local employers, in case the prospective student states she is not geographically mobile.

d. Special curricula (hypothetical or real) devised for the special needs of older women engineering students.

e. Indicators of probable success in an engineering major.

f. Ability to discriminate if past poor grades are due to lack of application or lack of talent.

g. Financial matters such as scholarships, loans, day care possibilities, and possible cooperative education work assignments.

6. Study scholarship and loan procedures and change as many as possible so that they can be used by older and part-time students, especially women.

7. Contact the faculty-staff or graduate student day care center regarding use by older women undergraduates, if your campus does not already administer day care facilities as open to any with a legitimate university-related need for the services.

8. Contact local industry for special scholarship or loan funds for older women engineering students. These students are more apt to stay in the local area upon graduation than many others. Alternatively, local employers might wish to sponsor some of their present women employees as engineering students.

9. Hold a workshop for women, age 25-40, in your region to explain engineering in some depth and help them decide if it is suitable for them.

FURTHER CONTACTS

For further discussion on the possibilities of encouraging older women students as engineers, you can contact one or more of the following:

1. Miss Betty Lou Bailey
   Schuyler 16, Netherlands Village
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2. Prof. Helen L. Plants
   Mechanical Engineering and Mechanics
   West Virginia University
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3. Executive Secretary
Society of Women Engineers
Room 305 - United Engineering Center
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There are sections of the Society of Women Engineers in Atlanta, Baltimore/ Washington, Boston, Chicago, Connecticut, Denver, Detroit, Hartford, Los Angeles, Milwaukee, New Jersey, New York City, Pacific Northwest, Philadelphia, Pittsburgh, St. Louis, San Francisco - Golden Gate, San Francisco - Bay Area, South Ohio, Southwest (Phoenix) and Texas. Also there are numerous student sections at engineering colleges. These can serve as local contacts.

SUMMARY

Excellent opportunities exist for mature women to embark upon careers as engineers and to make significant contributions to the nation's continuing technological development and to engineering solutions to many of society's problems. Engineering colleges should actively aid appropriate women to make this career choice and to achieve the necessary degrees.

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INDUSTRIAL PROGRAMS FOR REENTRY OPPORTUNITIES FOR WOMEN AS ENGINEERS

Committee on Women in Engineering

American Society for Engineering Education

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INDUSTRIAL PROGRAMS FOR REENTRY
OPPORTUNITIES FOR WOMEN AS ENGINEERS

THE UNSEEN OPPORTUNITY

In pursuit of equal employment opportunity goals, industry is often interested in hiring women with an engineering degree, since this qualifies a woman for a wide variety of industrial jobs which lead to increased responsibilities and promotions. Many of these companies have become sponsors of programs, activities, and scholarships designed to encourage high school girls to pursue an engineering career. Meanwhile these same companies have usually ignored another significant source of woman engineers--the woman between 25 and 40 years, not really an older woman, but older than the traditional college student of the past. The substantial number of women college students of this age is a recent phenomenon. Current estimates are "one and a half million women college students between twenty-five and thirty-four years old"[1] and "almost 500,000 women over thirty enrolled in college."[2]

At this age, a woman will prepare seriously for a career for a variety of reasons such as:

- Exposure to the business world has revealed career possibilities not understood or appreciated when she was in high school.
- The full-time housewife era in her life has terminated and she now wants a challenging and remunerative future career requiring college preparation.
- Divorce, desertion, or death has presented the basic problem of providing an adequate income for the woman and her children.
- A married woman with children realizes a second income seems the best solution to the impending financial problems of providing a college education for the children.

Older students, men and women, have been welcomed by their professors, since they generally are serious and dedicated students who add maturity to class discussion. Even when a bachelor's degree is earned as late as age 40, a working career of 25 years is possible. Hence, even if it may seem unusual to hire someone in their thirties for an entry level engineering position, it is as sensible as hiring any other new graduate.

POSSIBILITIES FOR INDUSTRIAL ACTION

The possibilities for encouragement of women aged 25-40 in preparing for an engineering career are varied and should be established, based primarily on the needs of particular industries and available engineering schools. The encouragement of the somewhat older woman to study engineering is probably most effectively done on a direct and local basis.In some instances a company will work mostly alone, but in other localities the company will prefer cooperating with other employers of engineers.

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1 Glamour, Jan. 1976, Pg. 149

2 Schenectady Gazette, Feb. 2, 1976, quoting U.S. Census Bureau

The financial expenditure for such a program is expected to vary widely. Administration of such a program with a sincere interest in its accomplishment is probably the key element in making it a success.

A PROGRAM FOR PRESENT EMPLOYEES

The attraction of a program to encourage suitable women employees to study engineering lies in the employer's ability to identify and select candidates who are known to be capable workers. Appropriate aptitudes and strong basic work habits are readily known. Motivation, of course, must be supplied by the student herself. Sometimes, however, the engineering career needs to be presented for consideration simply because no one has previously suggested it to a particular woman.

The backgrounds of the candidates are apt to be diverse, from high school graduates with no college to college graduates in some other major. Hence, the program needs to be quite flexible.

The program could include such things as:

1. Reimbursement of tuition, textbooks, and other related students expenses such as parking, babysitting, etc.

2. Released time from the job to attend class.

3. Counseling services--by company personnel, campus representatives brought to the industrial plant, or both.

4. Publicity on the program to both shop and office women.

AN INDUSTRIAL PROGRAM WITH LOCAL COLLEGES OF ENGINEERING

A company is also encouraged to work with one or more local colleges of engineering to increase the enrollment of somewhat older women students in engineering. In this case the objective could be either to enroll the company's own employees or to attract older women throughout the local area. Better yet, the objective could be to enroll both employees and other women. The company should probably establish a designated contact person to work with the engineering school(s). As a result of coordination between this contact and the engineering school administration, the following might be undertaken:

1. Review admission procedures for students with no recent academic work. Some colleges will automatically reject an application from someone with no academic studies in the last five or ten years because they fear the student has forgotten how to study. Actually there have been studies which show that returning adults perform far better than the average "straight from high school" student. If the engineering school is adamant about recent academic courses, the industrial contact person may have to recommend to some women with engineering potential that they take mathematics or basic science courses somewhere else and then reapply to the engineering college.

2. Review part-time enrollment procedures. Industry should encourage the acceptance of part-time students. This is particularly important to a woman, whether she is studying on released time from her employer or whether her home responsibilities preclude full-time student status.

3. Review the catalogs and brochures to assure emphasis on engineering as an increasingly popular field for women. The industrial contact could perhaps supply a photograph or two of a woman engineer at work.

4. Arrange special counseling for students with some prior college credits or even a degree in some other field, to enable a student to get maximum use of prior work. Such counselors could help potential students feel at ease by devising sample curricula for hypothetical students.

5. Have several extended discussions with the engineering counselor to be sure that, in addition to academic counseling, the engineering counselor is knowledgeable in such matters as:

   a. General opportunities in engineering. (Industrial input is especially valuable in this area.)

   b. Fields of engineering which are most sought by local employers, in case the prospective student states she is not goegraphically mobile.

   c. Anti-discrimination laws, current salary offers for men and women engineering graduates, and actual experiences of women engineers. A special meeting with present women employees who are engineers could be arranged.

   d. Indicators of probable success in an engineering major.

   e. Ability to judge whether past poor or mediocre grades are more likely due to lack of application or lack of talent.

   f. Fiancial matters such as scholarships, loans, day care facilities, and possible cooperative education work assignments.

6. Review scholarship and loan procedures to see if they are apt to directly or indirectly exclude older women. For instance, are part-time students eligible?

7. Set up industrially-sponsored scholarships specifically for women engineering students in the 25-40 age range, or whatever age range seems best. Several local industries might collaborate on such scholarship aid.

8. Determine if the day care center is restricted to faculty, staff, and graduate students, or is also open to undergraduates with children. Such facilities should be open to anyone with a legitimate campus-related need. Make sure that child care can be available during evening school as well.

9. Hold a special workshop, with joint sponsorship by one or more local engineering colleges and one or more local industries, for women aged 25-40 to explain engineering as a "reentry" career of high potential. This workshop should explain engineering preparation and engineering jobs in substantial depth. Available scholarships, part-time employment, cooperative education programs, and child care should also be covered. Above all, the presentations should be realistic, so that only those women with appropriate talents attempt the engineering degree. They should receive a reasonable view of the engineering needs of the local area and of the nation as a whole.

AN INDUSTRIAL PROGRAM WITH LOCAL COLLEGES OF ENGINEERING TECHNOLOGY

A similar program can be established for somewhat older women in conjunction with a local college of engineering technology. The foregoing considerations and recommendations for an engineering program would generally be applicable to the technology program as well.

Engineering technology will attract substantial numbers of hard-working women now in low-paying jobs. These women have the necessary ambition and persistence to upgrade themselves, but may perfer the technology program for the following reasons:

1. Serious basic deficiencies in mathematics that may deter some women from pursuing the engineering program are less of an obstacle in the technology program where administrators could offer appropriate preliminary mathematics courses to remove rust and retread mathematics skills.

2. If part-time study is elected and the woman has no prior college credits, the two-year engineering technology course does not require the formidable number of years that an engineering degree does.

A technology program should be an adjunct to an engineering program as an alternative for women who may not wish to enter the engineering program, rather than the sole program. This is important to assure the women of today that industrial companies want them not only as assistants to engineers but as engineers as well.

In planning a technology program, the industrial company should take into consideration the likelihood that some women technologists may later decide they wish to become engineers, but find that some of their technology credits are not acceptable to the local (or other) engineering colleges. Their credits would, however, usually be accepted in a four-year Bachelor of Engineering Technology program.

Two years of engineering or a two-year engineering technology degree qualify the worker for essentially the same jobs. In the former case, the future possibilities are greater so that the woman who wishes to go farther eventually, may do so with greater ease. This should be considered in advising program entrants.

FURTHER CONTACTS

For further discussion on the possibilities of encouraging somewhat older women to become engineers, you can contact one or more of the following:

1. Miss Betty Lou Bailey
   Schuyler 16, Netherlands Village
   Schenectady, NY 12308

2. Professor Helen L. Plants
   Mechanical Engineering and Mechanics
   West Virginia University
   Morgantown, WV 26506

3. Executive Secretary
   Society of Women Engineers
   Room 305 - United Engineering Center
   345 E. 47th St.
   New York, NY 10017

SUMMARY

Many existing programs to explain engineering to women are aimed at high school students, thus ignoring the somewhat older woman who is considering college enrollment. Such women are steadily increasing in numbers and frequently approach a career choice with more appreciation of the potential career opportunities than do younger women who have had less life experience. Here lies a substantial opportunity to increase the number of women engineers.

ENCOURAGING REENTRY WOMEN AS ENGINEERING TECHNOLOGY STUDENTS

Committee on Women in Engineering

American Society for Engineering Education

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ENCOURAGING REENTRY WOMEN AS

ENGINEERING TECHNOLOGY STUDENTS

THE OPPORTUNITY FOR WOMEN

Currently women have excellent opportunities in engineering technology careers. Many more women high school graduates are enrolling in programs in higher educational institutions than formerly. Most of the counseling efforts have been directed toward these students.

Meanwhile another recent phenomenon on campuses has been the large increase in mature women technical college students. Current estimates are one-and-a-half million women college and technical institute students between 25 and 34 years old and "almost 500,000 women over 30 enrolled in college". These women, roughly age 25 to 40, represent a relatively untapped source of women engineers and engineering technologists.

Mature students, men and women, have traditionally been welcomed by their instructors since they are generally serious students who do their homework conscientiously and add maturity to class discussions. A woman achieving a degree as late as age 40 still has a working career of as much as 30 years ahead of her.

It should be pointed out that engineering technology, unlike engineering, is a two-level career field and appropriate educational programs exist in each.

1. The engineering technician. Prepared typically at a two-year college. Program is two years in length and culminates with an associate degree. This leads to excellent careers. Engineering technicians are currently in high demand by industry.

2. The engineering technologist. Prepared by a four-year program or at times in a 2 + 2 format, with an associate degree required for admission.

Engineering technology education can, therefore, be taken in "smaller bites" with more immediate goals and rewards than some of the more traditional higher education programs.

PROBLEMS WOMEN ENCOUNTER

The problems which arise for the mature woman engineering technology student, which are administrative in nature, can be solved by appropriate and considerate procedures. For example:

1. Part-time enrollment in daytime courses may be desired. Some engineering technology institutes and colleges have rather arbitrary rules about not allowing such enrollment.

2. Special individualized counseling may be required for students with some prior college or other post high school credits, or perhaps even an associate degree in some other field, to enable the student to gain maximum use of prior work and experience.

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3. Some schools will automatically reject an application from someone having no academic course work in the last five or ten years because they fear the student has forgotten how to study.

4. If the only engineering technology institution within feasible commuting distance turns down a woman, she cannot become an engineering technician or technologist unless she moves. Mature women are often less mobile than men of the same age.

5. School costs are high for all, but may be excessive per credit hour for part-time students. The justification that part-time students usually have employment income may not be as true for the mature woman student.

6. Scholarships and loans often are more difficult for older students to obtain. Mature students are less apt to participate in campus activities and this often is a factor in gaining financial assistance, along with need and high grades.

7. Part-time students often are not eligible for scholarships and loans.

8. Convenient, inexpensive care for children is often needed while women students attend class.

Another problem which handicaps many mature women is the debilitating effect of "math anxiety" and lack of recent or reliable math instruction. In the past it was acceptable for high school women to take only minimal mathematics, since they would "not need it anyway", or because "girls do not have mathematical minds". The returning adult may be suffering from such attitudes. Overcoming such negative self images and lack of confidence may be the biggest obstacle to be faced. The administrator could probably increase enrollments of mature women by offering appropriate preliminary mathematics courses to remove rust and retread mathematics skills.

SUGGESTED ACTIONS FOR DEANS OF ENGINEERING TECHNOLOGY

1. Study present admissions procedures from the viewpoint of mature women engineering technology students and change those that impede their enrollment. Returning adults frequently perform far better than the average "straight from high school" student. Reexamine restrictions on part-time enrollment for serious students.

2. Should the technical school or college retain a policy of rejection if there is no recent academic work, this should be explained in the letter of rejection with the suggestion that the applicant obtain some credits elsewhere and reapply to the technical institute later. If this is the only problem, encouragement may enhance motivation.

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3. If engineering technology is offered as an evening program, where many students are older, catalogs and brochures should mention that engineering technology is an increasingly popular field for women.

4. Designate a person to specialize in individual counseling of mature women students in engineering technology and have him/her devise some sample criteria for hypothetical students, such as:

   a. A student with one year of liberal arts but with no mathematics, who wants to work full-time toward a BSET in electrical engineering technology.

   b. A student with no college who wishes to attend daytime, working toward a BSET at 2/3 load.

   c. A student with industrial experience, but no formal education, who wishes to redirect her career goal toward engineering technology.

   d. A student with a semester of college who wants a BSET in civil engineering technology at about 3/4 full load.

5. Designate a person to counsel prospective mature women engineering technology students. This counselor should be knowledgeable about:

   a. General opportunities in engineering technology.

   b. Anti-discrimination laws, current salary offers for men and women engineering technology graduates, and actual experiences of women engineering technologists.

   c. Fields of engineering technology which are most sought by local employers, in case the prospective student states she is not geographically mobile. This person should establish that there is a local need for engineering technicians and technologists, so that the students will not be given the false hope that jobs are available and plentiful when their schooling is completed.

   d. Special curricula (hypothetical or real) devised for the special needs of mature women engineering technology students.

   e. Indicators of probable success in an engineering technology major.

   f. Discriminators which reveal whether poor grades earned in the past are due to lack of application or lack of talent.

   g. Financial matters such as scholarships, loans, day care possibilities, and possible cooperative education work assignments.

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6. Study scholarship and loan procedures and change as many as possible so that they can be used by older and part-time students, especially women.

7. Contact the faculty-staff or student day care center regarding use by mature women students needing part-time facilities, unless your campus already administers day care facilities open to any with a legitimate school related need for the services.

8. Contact local industry for special scholarship or loan funds for the mature women engineering technology students. These students are more apt to stay in the local area upon graduation than many others. Alternatively, local employers might wish to sponsor some of their present women employees as engineering technology students.

9. Hold a workshop for women, age 25-40, in your region to explain engineering technology in some depth and help them decide if careers as engineering technologists or technicians are suitable for them.

10. Provide role models with whom the returning student can identify, i.e., female faculty members or practicing engineers.

11. Offer math anxiety or math review workshop for students considering application for admission.

FURTHER CONTACTS

For further discussion on the possibilities of encouraging older women students as engineering technicians, you can contact one or more of the following:

1. Miss Betty Lou Bailey
   Schuyler 16, Netherlands Village
   Schenectady, NY 12308

2. Prof. Helen L. Plants
   Mechanical Engineering and Mathematics
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4. Society of Women Engineering Technicians
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SUMMARY

Excellent opportunities exist for mature women to embark upon careers as engineering technicians or technologists and to make significant contributions to the nation's continuing technological development as well as to technical solutions to many of society's problems. Engineering technology should actively aid mature women to make this career choice and to achieve the necessary education.

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